

**UPDATE: FIELD EXPERIENCE IN SUSTAINABLE
DEVELOPMENT AND HEALTH CARE IN ECUADOR
UNIVERSITY OF COLORADO DENVER WINTER FIELD METHODS
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INTRODUCTION

Building upon the research from the first year of the field experience program, the second year's students from the University of Colorado Denver and the Colegio Técnica Yachana continued their exploration of sustainability in the complex setting of Mondaña and the surrounding region. Because the group of students from UCD was much smaller this year (five students versus sixteen students), the group's project and focus was necessarily narrower. In addition to our research project that assessed the use of water filters delivered and installed in January, 2007 in two nearby villages, we observed and studied a number of changes in the lodge, the colegio, and the community of Mondaña that occurred over the past year. Most of these changes resulted from positive growth of the Yachana Foundation's various programs and projects initiated in the community of Mondaña, which, in turn, brought new challenges to the community and its institutions and to the field experience.

OBSERVED CHANGES

Yachana Lodge. Although the main lodge has changed little since last year, there were significant changes in the infrastructure from the previous year. Newly built and painted signs marked the path from the lodge's dock at the river to the main lodge. A new, concrete path and steps led up from the river to the main lodge where one porch has been removed and replaced by a garden in anticipation of redesigning the main lodge. Because the number of guests the lodge can accommodate is already the maximum that can be accommodated sustainably without placing an undue burden on the local environment, there are no plans to increase the number of guest rooms at the lodge. There are plans to gradually improve the existing rooms to increase their size, privacy, and amenities.

Upriver from the main lodge building, a new set of bathrooms is under construction, and beyond the final set of guest rooms, looking out over the river to the southwest, a new kitchen building is also under construction. This building will house a state of the art kitchen for commercial food preparation for lodge guests and for teaching the preparation and cooking of local foods to ecotourists. Next to the new kitchen is a new dining area, consisting of two hexagonal wooden decks covered with a thatched roof, projecting over the sloping bank with magnificent views of the river and surrounding forest.

These new buildings -- bathrooms, kitchen, and dining room -- will serve the new Yachana Culinary Institute, funded by a grant from the National Geographic Society. The culinary institute's purpose is to preserve knowledge of local foods and their preparation, to work with nutritionists to understand their nutritional composition and value, and to share this knowledge with ecotourists through teaching classes on the preparation of local Amazonian cuisine. Examples of locally available and sustainably produced foods include hearts of palm and associated beetle larvae, stinging nettles, chocolate, plantains and bananas, jungle grapes, tilapia (not native but sustainable farmed), and lemon grass.

As with all the enterprises at the lodge, the goal of the culinary institute is threefold: 1) to preserve local knowledge, practices, and ecology while acknowledging and accommodating global change; 2) to share this knowledge and an appreciation for the local ecology and culture with tourists, and 3) to generate income for the Colegio.

Yachana Rainforest Preserve. The preserve has a new full-time director, Thomas Fletcher who provided us with an interview about his plans for the preserve and a guided tour through the heart of the rainforest preserve. Although we searched diligently, we encountered neither the elusive and nocturnal dwarf forest caiman nor the black tamarinds that live in the preserve; however, we did observe the diversity of plants typical of a mature rainforest, some very active jumping fish, and magnificent scenery.

The Yachana Rainforest Preserve's 1,400 hectare section represents the single largest remaining parcel of mature rainforest outside of but contiguous with the national Gran Sumaco Biosphere Reserve and represents a significant buffer zone for Gran Sumaco. As with similar projects throughout the world, Yachana's preserve must balance development and human use with environmental preservation and thus faces several challenges. Ecuador's rainforest is disappearing at a faster rate (1.24% annually) than in any other South American country. At the same time, local residents rely on agouti and other forest animals for meat and increasingly on roads to transport their agricultural products to market. The national government recently built a road through the preserve by right of eminent domain that benefits residents of the neighboring communities of Agua Santa and Puerto Rico. It has increased hunting incursions into the preserve from every 2-3 months to every 2-3 weeks.

In response, the preserve has adopted an Integrated Conservation Development Program (ICDP) that includes building a rainforest demonstration and education center accessible by the new road to teach local residents and ecotourists about the value of the rainforest,

demonstrate sustainable agricultural practices, and engage them in efforts to preserve it while allowing some access to the rainforest. The Yachana Foundation recently received a grant of \$45,000 (?) from the Isora Foundation in New Mexico that will partially fund the education center at the preserve.

Mr. Fletcher's goals for the preserve include 1) developing a protection regime, 2) continuing systematic scientific research, e.g., measuring dung beetle populations as an indicator of the health of the rainforest, experimenting with ways to accelerate forest regeneration following cultivation, and reintroducing two primate species, and 3) increasing forest cover by 200 hectares.

Colegio Técnico Yachana. Some of the most dramatic changes we observed were at the Colegio. When you reach the main campus, on your right is a new two-story dormitory building, almost fully completed and already partially occupied. Beyond the original dormitory, the new microenterprise classroom, which was under construction in January, 2007, is now finished and fully functioning. These buildings represent materially the addition of a third and final year of students to the colegio: there are currently 140 students in three grades (equivalent of US grades 10-12). Each class is divided into two groups that alternate attendance in 28-day blocks. Girls currently comprise 15% of the student population and the faculty would like to increase the proportion of female students. One result of adding the third class and of having two previous years of operation is that incoming students are generally younger than those in the two senior classes; however, the average age of colegio students is still somewhat older than in other high schools in the region or than in equivalent programs in the US. For example, the average age of students in the 10th grade is 16, in the 11th grade 18, and in the 12th grade 20.

Because of the practical nature of the education at the colegio and the intensive work that students do, the Colegio needed to develop an effective admissions process to ensure a good fit for incoming students. As of 2006, prospective students submit a written application with documentation of completion of middle school and a \$20.00 application fee. After submitting their written application, candidates must spend two full weeks at the school, living and working alongside the colegio students, after which period currently enrolled students and teachers evaluate the candidates and make a decision regarding their admission to the school. Since the institution of this process the attrition rate has stabilized between 8% and 15% per year. Tuition for the year is \$80 and provides each student with five T-shirts, insurance, and matriculation fees. A donation of \$1,200 will sponsor one student's three-year program at the Colegio.

Students and faculty at the colegio anticipate their first graduating with excitement and some anxiety. There was much discussion among students and faculty of what the appropriate ceremony should be, when it should be held to accommodate the two groups of students, and how they would assist families from communities far from the school to attend. Several Ecuadorian universities are offering scholarships to graduating students. Seniors that we spoke with expressed a mixture of joy at their achievement and trepidation about how they would realize their goals. Another aspect of the impending

graduation is to develop a plan to evaluate the educational process of the Colegio and its long-term outcomes and to follow-up with graduates and provide some continuing support to them. One proposal under discussion is to provide two years of post-graduate study that would extend the curriculum of the Colegio and provide college preparatory courses.

Recycling. One way that the Colegio (Foundation?) has reached out to the surrounding communities is to encourage and support recycling. At the lodge and the Colegio, organic material is composted for use in the gardens and agricultural fields, paper is burned, and glass, metal, and plastic are collected for recycling in Tena. The city charges a fee for processing recyclable materials; however, the (Foundation or Colegio?) and Tena have an agreement that in exchange for collecting recyclable trash from surrounding communities, the city will waive the fee. The students also installed garbage cans (suspended above the ground and covered) throughout the village of Mondaña and three other communities.

Animal Husbandry. The chicken and pig raising projects continue to do well. When we visited, there were four adult sows and five piglets. Ducks had been added since the previous year to provide eggs and meat for the Colegio students.

Sustainable Agriculture. The Colegio is actively seeking to increase its production of rice and to that end purchased a 50 hectare farm adjacent to and downriver from the agricultural fields at the colegio. In addition to more land, Rob Nivison, a volunteer, is working to increase agricultural yields by enriching the soils using charcoal. The project is based on the concept of terra prieta, a practice of pre-Columbian residents of the Amazonian basin in which a layer of charcoal is placed in the soil to create rich soil that can be cultivated intensively and repeatedly. The carbon in the charcoal attracts minerals such as nitrogen and phosphorous necessary to plant growth and hold them in a manner so that plants' roots can absorb them. The carbon also reacts with fungi to tap carbon from decaying roots to stop the carbon loss that is typical of denuded soils in the tropics. The charcoal is manufactured by burning downed trees in pits covered with soil and then placing a thin layer of charcoal mixed with soil and some organic material about 4-5" beneath the surface. This is a labor intensive, but one-time investment in soil improvement.

This one-time investment is combined with the regular use of Effective Microorganisms (EM) an organic fertilizer, compost, and the liquid fertilizer that comes from the biodigester. EM is made by combining raw cow or pig manure with milk, sugar cane molasses and water and allowing it to ferment for microorganism growth. If successful, rice productions should increase by several times per hectare and they should be able to grow three crops of rice each year without having to take fields out of production. Given the pressure on land in the region, this should present a viable alternative to usual agricultural production practices and, after the initial investment in soil improvement (which could be done over a period of years), should reduce the cost of production by decreasing reliance on commercial fertilizers.

In addition to trying these techniques at the Colegio, the municipal government of Loreto has also requested that he establish a demonstration project through the local schools there with the hope that when local farmers see increased productivity they will want to implement the practice on their farms.

Microenterprise. There was one new project and two on-going projects that have had significant expansion over the past year. The new project, just begun when we arrived with the bottle cutter, involves recycling wine bottles from the lodge to create candles that can be sold in the gift shop. The bottoms of the bottles are cut off and the cut edge smoothed. Then they are filled with candle wax and a wick and decorated with designs created by the students at the Colegio and include the name Yachana Lodge.

In November, a group of five engineering students from the Colorado School of Mines under the direction of faculty member Julie Lanning, visited Mondaña to work on the development of a small hydroelectric generator that could generate electricity for the Colegio and also become a product that students could build and sell to local farmers who have access to streams or other usable sources of water. The cost of these generators will be less than the \$800 it costs to purchase a commercially manufactured 2,500 watt generator commonly used in the area and will not consume non-renewable fuels.

The on-going microenterprise project that expanded dramatically was the water filter project. The morning after our arrival in Mondaña, a Saturday, we visited the local market in Agua Santa where several students from the Colegio were waiting for rides to take them home for their 28-day time away from school. Several of these students had water filter systems with them, and they explained that they had been given them to take to their homes. Douglas McMeekin later explained that one of the visitors to the lodge had given a donation so that each incoming colegio student could have a water filter system for their home.

Last year, along with the Colegio students, we visited eight villages that received water filter systems for their primary schools. Because of personnel changes in the faculty at the Colegio, there were no other visits to deliver new filter systems or to follow-up on the status and use of systems that had been delivered. The government of Loreto had recently purchased 100 water filter systems for distribution to schools in the cantón (similar to a county in the US). The colegio students were busy assembling the filter systems and refining their presentation skills to teach local school children and teachers about their use and care and the biology related to the transmission of waterborne diseases. Amanda Israel, who had been a student in last year's field experience and who raised funds to return this year, worked closely with the colegio students and the new microenterprise teacher, Daniel Recalde on this aspect of the water filter project. On the final day of our time in Mondaña, we accompanied the colegio students, the Colegio's director, Miguel Murillo, Rob Nivison, and Daniel Recalde to present the filters to the mayor of Loreto and other county officials and educators at a local elementary school.

Mondaña. In terms of health care through the clinic, the major change we observed from last year is that the clinic was fully staffed. In addition to Arturo Grefa, who is the

health auxiliary who is employed by the Yachana Foundation to work at the clinic, there was a nurse, a dentist and two doctors at the clinic. There were patients sitting on the porch waiting to be seen almost every time we passed the clinic during the day. We interviewed Arturo again this year. He reported that members of the fire department in Tena had given a first aid course to residents of Mondaña and that there was some talk of putting a hospital in Mondaña. But with respect to common illnesses and health concerns, there was little change from last year.

There was evidence of two other changes or initiatives in the community of Mondaña. The first was a small kiosk that had been built along the path leading from the lodge through the village just before you reach the primary school. Douglas McMeekin shared that it was designed as a venue for selling locally produced crafts to tourists walking through the village. While we were there it was not occupied but did serve for a place for community members to sit on benches beside it and talk.

Arturo Grefa had requested and was assigned a Peace Corps volunteer, Kristin Waslaw, to work on health issues in the community. She had been in Ecuador for four months when we arrived and felt like she was ready to work with members of the community on projects related to sanitation and clean water.

STUDENT RESEARCH 2007-08

The group of students in this year's cohort was much smaller than in 2006-07 and represented greater diversity in academic backgrounds. During the classroom sessions prior to our departure for Ecuador, the group decided on three foci for their research: 1) to document significant changes in the school's agricultural activities and program, 2) to extend the assessment of community health begun the previous year with a more intensive focus on water and sanitation, and 3) to follow up on the results of the water filter project begun the previous year.

As in the previous year, we spent the first few days in Mondaña getting oriented to the community, the lodge, and the colegio and conducting key informant interviews with lodge, foundation, and colegio staff members. By the beginning of the second week we had determined that we would be able to update the status of the agriculture program and follow up on the use and condition of the filters that had been delivered the previous January in two nearby communities: 30 de Agosto and Puerto Rico. Although we would have liked to extend the community survey that we did last year to incorporate more households and to inspect and test the water quality of the local water sources in Mondaña, this would have affected the work of the Peace Corps volunteer and so we confined our research to the two communities mentioned above.

Our group was assigned two students from the colegio who were from Puerto Rico and Agua Santa, to work with us and to provide entrée into the two communities. Together they worked with the UCD students to develop a set of questions that focus on water sources and treatment and sanitary facilities in the village and questions about basic health conditions and common illnesses. One of the UCD students, Frances Fierst, who

is an environmental engineer, had brought field water testing kits with her. We showed the colegio students how to do the tests. (You place one drop of water onto the culture medium, press out all the air as your cover it, seal it in a plastic bag and then place it next to your body or under a light bulb in a box and allow it to incubate for 24 hours). We demonstrated the tests using samples of water from the filters at the colegio and from the Rio Napo. As expected, no coliform bacteria were cultured from the sample from the colegio's water filter, but both fecal and non-fecal coliform bacteria were cultured from the sample from the Rio Napo. After preparing for the tests and the survey, Sharry Erzinger visited the two villages with the colegio students to let them know we would be visiting.

In each village we visited the local primary school where the colegio students presented a short talk to the students, asking them questions about clean water and hand washing and common illnesses. We observed the water filters that had been given to the schools the previous year. In each case, the water filters were not currently in use. In Puerto Rico, the teacher explained that one of the filters had been broken when the entire assembly was dropped returning from the stream where it was filled. Another of the filters had black sediment, apparently carbon from the filter in the bottom bucket. None of the filters had been replaced since the previous year and the villages had not been visited by the colegio students to assess how they were functioning. After speaking to the students, we then approached members of the community to see if they would be willing to be interviewed. We divided up into teams consisting of colegio students and UCD students based primarily on language ability. We completed a total of ____ interviews in the two villages.

UCD students, working with the two faculty members, developed an Access database into which data from key informant interviews, observations, and results of community interviews were entered, coded, and then analyzed for important themes related to water and sanitation.

The UCD students felt strongly that they wanted to return to the two villages we visited to share the results of our interviews with them; however, the day we were scheduled to return there was a conflict over the use of canoes and we were not able to complete this last phase of our project as planned.

From the community interviews, we concluded that, based on responses of those we interviewed, with regard to the water filter systems:

- Many people do not know how to clean the filters
- They do not know when they should replace the filter elements
- They do not know where to buy the filter elements to replace them
- They do not know the cost of replacing the filter elements
- Some filters in the communities were broken
- That it is not possible to buy the filters because the cost of them is too much
- That they cannot spend the money to construct bathrooms

With regard to water use, we concluded:

- Few people drink water here (as in glasses of water as is common in the US)
- Although many people know that they need to boil their water, they do not
- The majority of people do not believe that they get sick because of the water

With regard to sanitary practices, we concluded:

- Some families had pit latrines that they used when they were at home.
- In 30 de Agosto there were functioning toilets and running water for hand washing available at the school for use by the primary school students and households that lived near the school.
- In Puerto Rico the school had no functioning toilets and no running water for hand washing.
- When far from a latrine or when latrines or toilets were not operating, children and adults eliminate wastes “in the fields” or woods, they do not cover or bury it, and children often eliminate wastes directly into the same streams and rivers where they and their family members bathe, swim, wash dishes and clothing, and obtain water for cooking and drinking.
- Every untreated sample of water we tested was contaminated with fecal bacteria.

The results of the project were shared with students and faculty at the colegio on our last Sunday evening in Mondaña. In the presentation we recommended that as the colegio students continue with the water filter project they consider the following recommendations:

- Tell people not to move the filters because they are fragile
- Recommend the use of another bucket to obtain water for filtration
- With water that has a lot of sediment, wait until the sediment settles to the bottom of the bucket, and then pour the water into the filter
 - To extend the life of the filter
 - To reduce the frequency of cleaning
- Sell the filter systems and the filter elements in the various markets

CONCLUSIONS AND RECOMMENDATIONS

We witnessed evidence of much progress in many of the foundation’s programs from last year. Perhaps the most significant is the addition of the final class to the colegio and the upcoming graduation of the first class of students. Applications and enrollment remain high and there is a desire to extend current opportunities by creating a post-graduate program. One of the most urgent needs is for systematic research and evaluation of the outcomes of the colegio’s program by following graduates over the next few years and by continuing to document the colegio’s curriculum-related projects, e.g., various microenterprises and efforts toward sustainability in food production, recycling, and renewable energy generation.

With growth and expansion come challenges in coordinating, organizing, and accommodating the needs of various projects and groups. Groups such as ours intend to provide service to the local community, but must also respond to changing needs and priorities. Colegio students were fully occupied with their own projects and so we were

more limited than last year in the number of students with whom we could work. The presence of a Peace Corps volunteer in Mondaña in the early stages of her tour meant that our work in the village was also limited. The success and visibility of the Yachana Lodge and CTY may be leading toward what Robert Chambers describes as “project bias,” in which model projects become the object of so much attention from foreign visitors and researchers that “Fame forces project managers into public relations” (1983:17). To some degree, CTY’s director must constantly guard the students from projects that will take them away from their studies; however, on the other hand, the more distance placed between outsider and the foundation, the colegio but also the village of Mondaña, the less able outsiders will be to critically, constructively, and accurately evaluate the various programs and projects.

As in other regions of the world, conservation and development interact in complex relationships of local history and institutions, individual and community needs, forces of global development including market driven resource exploitation (Igoe 2004). The same forces that propel the destruction of Ecuador’s rainforest contribute to the overhunting of primates and conflict with the goals of the Yachana preserve. Roads bring people closer to the preserve but, as Tom Fletcher notes, may also bring them closer to demonstrations of alternative ways of cultivating that land that are more sustainable for both the environment and its human inhabitants.

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